

CLAIMS

1. A method of managing a cache of a mobile device carried by a user, the cache being used for storing items associated with locations in a real-world space being visited by the user; the method comprising the steps of:
 - (a) determining the probability of usage of an item in dependence on the user's progress around the space;
 - (b) changing the contents of the cache by adding or removing an item on the basis of the determination carried out in step (a) in respect of that item or other items.
2. A method according to claim 1, wherein in step (a) said probability of usage is determined on the basis of the distance between the location associated with said item and the user's current location in said space.
3. A method according to claim 2, wherein step (a) includes reducing said probability of usage where said item is associated with a location lying in a wake region extending behind the user with respect to the user's progression through the space.
4. A method according to claim 1, wherein in step (a) said probability of usage is determined on the basis of the distance between the location associated with said item and the onward track from the user's current location of a planned route being followed by the user.
5. A method according to claim 1, wherein in step (a) said probability of usage is determined on the basis of the distance between the location associated with said item and the onward track from the user's current location as predicted on the basis of the user's recent movement in said space.
6. A method according to claim 1, wherein in step (a) said probability of usage is determined using visit history data of previous users that have visited the space, step (a) including identifying relevant visit history data for use in determining said probability of

usage by matching the value of an indicator of the current user's progress around the space with values of that indicator in said visit history data.

7. A method according to claim 6, wherein said indicator is the user's current location, the
5 item usage probability determined in step (a) being determined by reference to the visit history data of previous users who have been in the same location as the user's current location, this determination using portions of said visit history data relevant to the track taken by previous users from the user's current location in order to determine an onward track for the user, the probability of usage of said item being derived on the basis of the
10 distance between the location associated with the item and said onward track.

8. A method according to claim 6, wherein said indicator is the user's current location, the item usage probability determined in step (a) being determined by reference to the visit history data of previous users who have been in the same location as the user's current
15 location, this determination using portions of said visit history data relevant to item usage onward from the user's current location.

9. A method according to claim 8, wherein step (a) includes reducing said probability of usage where said item is associated with a location lying in a wake region extending behind
20 the user with respect to the user's progression through the space.

10. A method according to claim 6, wherein said indicator is the user's recent movement in said space, the item usage probability determined in step (a) being determined by reference to the visit history data of previous users whose movement to the user's current
25 location corresponds to that of the user's recent movement, this determination using portions of said visit history data relevant to the track taken by previous users from the user's current location in order to determine an onward track for the user, the probability of usage of said item being derived on the basis of the distance between the location associated with the item and said onward track.

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11. A method according to claim 6, wherein said indicator is the user's recent movement in said space, the item usage probability determined in step (a) being determined by

reference to the visit history data of previous users whose movement to the user's current location corresponds to that of the user's recent movement, this determination using portions of said visit history data relevant to item usage onward from the user's current location.

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12. A method according to claim 6, wherein said indicator is the identity of the item whose associated location has been most-recently visited by the user, the item usage probability determined in step (a) being determined by reference to the visit history data of previous users who visited the same item-associated location as the user's most-recently visited item-associated location, this determination using portions of said visit history data relevant to item usage onward from the user's most-recently visited item-associated location.

13. A method according to claim 6, wherein said items are associated with virtual features each of which has an associated location in said space, the or each item associated with a said feature having as its own associated location the location associated with that feature; said indicator of the current user's progress around the space being the feature most recently visited by the user, and the item usage probability determined in step (a) being determined by reference to the visit history data of previous users who visited the same feature as the user's most-recently visited feature, this determination using portions of said visit history data relevant to item usage onward from the user's most-recently visited feature.

14. A method according to claim 6, wherein said indicator of the current user's progress around the space is the sequence of at least two items whose item-associated locations have been most recently visited by the user, the item usage probability determined in step (a) being determined by reference to the visit history data of previous users having a same sequence of visited item-associated locations as the sequence of item-associated locations most recently visited by the user, this determination using portions of said visit history data relevant to item usage onward from the user's most-recently visited item-associated location.

15. A method according to claim 6, wherein said items are associated with virtual features each of which has an associated location in said space, the or each item associated with a said feature having as its own associated location the location associated with that feature; said indicator of the current user's progress around the space being the sequence of at least the two features most recently visited by the user, and the item usage probability determined in step (a) being determined by reference to the visit history data of previous users having a same sequence of visited features as the sequence of features most recently visited by the user, this determination using portions of said visit history data relevant to item usage onward from the user's most-recently visited feature.

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16. A method according to claim 6, wherein said indicator is the identity of the item most-recently accessed for presentation by the user, the item usage probability determined in step (a) being determined by reference to the visit history data of previous users who accessed for presentation the same item as most-recently accessed for presentation by the user, this determination using portions of said visit history data relevant to item usage onward from the user's most-recently accessed item.

17. A method according to claim 6, wherein said items are associated with virtual features each of which has an associated location in said space, the or each item associated with a said feature having as its own associated location the location associated with that feature; said indicator of the current user's progress around the space being the feature associated with the item most recently accessed for presentation by the user, and the item usage probability determined in step (a) being determined by reference to the visit history data of previous users who accessed for presentation an item associated with the same feature as the item most-recently accessed for presentation by the user, this determination using portions of said visit history data relevant to item usage onward from the feature associated with the item most-recently accessed for presentation by the user.

18. A method according to claim 6, wherein said indicator of the current user's progress around the space is the sequence of at least the two items most recently accessed for presentation by the user, the item usage probability determined in step (a) being determined by reference to the visit history data of previous users having a same sequence of items

accessed for presentation as the sequence of items most recently accessed for presentation by the user, this determination using portions of said visit history data relevant to item usage onward from the user's most-recently accessed item.

5 **19.** A method according to claim 6, wherein said items are associated with virtual features each of which has an associated location in said space, the or each item associated with a said feature having as its own associated location the location associated with that feature; said indicator of the current user's progress around the space being the sequence of at least the two features associated with items most recently accessed for presentation by the user, and the item usage probability determined in step (a) being determined by reference to the visit history data of previous users having a same sequence of features with items accessed for presentation as the sequence of such features for items most recently accessed for presentation by the user, this determination using portions of said visit history data relevant to item usage onward from the user's most-recently visited feature.

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20. A method according to claim 6, wherein in step (a) said probability of usage is determined using portions of said visit history data that are relevant to the progression onward of the current user, said visit history data being data about one of:

- the items, or groups of associated items, next visited by said previous users;
- 20 - the items next accessed for presentation, or the groups of items with which those items are associated, by said previous users;
- the items next delivered, or requested for delivery, to the mobile-device caches of said previous users.

25 **21.** A method according to claim 1, wherein in step (b) an item is loaded into the cache, this item being the item in respect of which step (a) is effected, the probability of usage of the item being determined as being above a threshold value for loading items in the cache.

22. A method according to claim 1, wherein in step (b) an item is loaded into the cache, this item being an item not identified in a set of items having probabilities of usage, as determined by step (a), below a threshold value for loading items in the cache.

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23. A method according to claim 1, wherein in step (b) an item is removed from the cache, this item being the item in respect of which step (a) is effected, the probability of usage of the item being determined as being below a threshold value for retaining items in the cache.

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24. A method according to claim 1, wherein in step (b) an item is removed from the cache, this item being an item not identified in a set of items having probabilities of usage, as determined by step (a), above a threshold value for loading or retaining items in the cache.

10 **25.** An arrangement for managing a cache of a mobile device carried by a user, the cache being usable for storing items associated with locations in a real-world space being visited by the user; the arrangement comprising:

- prediction means for determining the probability of usage of an item in dependence on the user's progress around the space; and
- 15 - a cache manager for changing the contents of the cache by adding or removing an item on the basis of the determination carried out by the prediction means in respect of that item or other items.

26. An arrangement according to claim 25, wherein the prediction means is arranged to
20 determine said probability of usage on the basis of the distance between the location associated with said item and the user's current location in said space.

27. An arrangement according to claim 26, wherein the prediction means includes means for reducing said probability of usage where said item is associated with a location lying in
25 a wake region extending behind the user with respect to the user's progression through the space.

28. An arrangement according to claim 25, wherein the prediction means is arranged to
30 determine said probability of usage on the basis of the distance between the location associated with said item and the onward track from the user's current location of a planned route being followed by the user.

29. An arrangement according to claim 25, wherein the prediction means is arranged to determine said probability of usage on the basis of the distance between the location associated with said item and the onward track from the user's current location as predicted on the basis of the user's recent movement in said space.

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30. An arrangement according to claim 25, wherein the prediction means is arranged to determine said probability of usage using visit history data of previous users that have visited the space, the prediction means including identifying means for identifying relevant visit history data for use in determining said probability of usage by matching the value of
10 an indicator of the current user's progress around the space with values of that indicator in said visit history data.

31. An arrangement according to claim 30, wherein said indicator is the user's current location, the identifying means being arranged to identify as said relevant visit history data
15 the visit history data of previous users who have been in the same location as the user's current location, and the prediction means further including track-determination means arranged to use portions of said relevant visit history data indicative of the tracks taken by previous users from the user's current location in order to determine an onward track for the user, and probability-determining means for determining the probability of usage of
20 said item on the basis of the distance between the location associated with the item and said onward track.

32. An arrangement according to claim 30, wherein said indicator is the user's current location, the identifying means being arranged to identify as said relevant visit history data
25 the visit history data of previous users who have been in the same location as the user's current location, the prediction means being arranged to determine said probability of usage on the basis of portions of said relevant visit history data that concern item usage onward from the user's current location.

30 33. An arrangement according to claim 32, wherein the prediction means includes means for reducing said probability of usage where said item is associated with a location lying in

a wake region extending behind the user with respect to the user's progression through the space.

34. An arrangement according to claim 30, wherein said indicator is the user's recent
5 movement in said space, the identifying means being arranged to identify as said relevant
visit history data the visit history data of previous users whose movement to the user's
current location corresponds to that of the user's recent movement, and the prediction
means further including track-determination means arranged to use portions of said
10 relevant visit history data indicative of the tracks taken by previous users from the user's
current location in order to determine an onward track for the user, and probability-
determining means for determining the probability of usage of said item on the basis of the
distance between the location associated with the item and said onward track.

35. An arrangement according to claim 30, wherein said indicator is the user's recent
15 movement in said space, the identifying means being arranged to identify as said relevant
visit history data the visit history data of previous users whose movement to the user's
current location corresponds to that of the user's recent movement, the prediction means
being arranged to determine said probability of usage on the basis of portions of said
relevant visit history data concerning item usage onward from the user's current location.

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36. An arrangement according to claim 30, wherein said indicator is the identity of the
item whose associated location has been most-recently visited by the user, the identifying
means being arranged to identify as said relevant visit history data the visit history data of
previous users who visited the same item-associated location as the user's most-recently
25 visited item-associated location, the prediction means being arranged to determine said
probability of usage on the basis of portions of said relevant visit history data concerning
item usage onward from the user's most-recently visited item-associated location.

37. An arrangement according to claim 30, wherein said items are associated with virtual
30 features each of which has an associated location in said space, the or each item associated
with a said feature having as its own associated location the location associated with that
feature; said indicator of the current user's progress around the space being the feature

most recently visited by the user, and the identifying means being arranged to identify as said relevant visit history data the visit history data of previous users who visited the same feature as the user's most-recently visited feature, the prediction means being arranged to determine said probability of usage on the basis of portions of said relevant visit history data concerning item usage onward from the user's most-recently visited feature.

38. An arrangement according to claim 30, wherein said indicator of the current user's progress around the space is the sequence of at least two items whose item-associated locations have been most recently visited by the user, the identifying means being arranged to identify as said relevant visit history data the visit history data of previous users having a same sequence of visited item-associated locations as the sequence of item-associated locations most recently visited by the user, the prediction means being arranged to determine said probability of usage on the basis of portions of said relevant visit history data relevant to item usage onward from the user's most-recently visited item-associated location.

39. An arrangement according to claim 30, wherein said items are associated with virtual features each of which has an associated location in said space, the or each item associated with a said feature having as its own associated location the location associated with that feature; said indicator of the current user's progress around the space being the sequence of at least the two features most recently visited by the user, and the identifying means being arranged to identify as said relevant visit history data the visit history data of previous users having a same sequence of visited features as the sequence of features most recently visited by the user, the prediction means being arranged to determine said probability of usage on the basis of portions of said relevant visit history data concerning item usage onward from the user's most-recently visited feature.

40. An arrangement according to claim 30, wherein said indicator is the identity of the item most-recently accessed for presentation by the user, the identifying means being arranged to identify as said relevant visit history data the visit history data of previous users who accessed for presentation the same item as most-recently accessed for presentation by the user, the prediction means being arranged to determine said probability of usage on the

basis of portions of said relevant visit history data concerning item usage onward from the user's most-recently accessed item.

41. An arrangement according to claim 30, wherein said items are associated with virtual features each of which has an associated location in said space, the or each item associated with a said feature having as its own associated location the location associated with that feature; said indicator of the current user's progress around the space being the feature associated with the item most recently accessed for presentation by the user, and the identifying means being arranged to identify as said relevant visit history data the visit history data of previous users who accessed for presentation an item associated with the same feature as the item most-recently accessed for presentation by the user, the prediction means being arranged to determine said probability of usage on the basis of portions of said relevant visit history data concerning item usage onward from the feature associated with the item most-recently accessed for presentation by the user.

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42. An arrangement according to claim 30, wherein said indicator of the current user's progress around the space is the sequence of at least the two items most recently accessed for presentation by the user, the identifying means being arranged to identify as said relevant visit history data the visit history data of previous users having a same sequence of items accessed for presentation as the sequence of items most recently accessed for presentation by the user, the prediction means being arranged to determine said probability of usage on the basis of portions of said relevant visit history data concerning item usage onward from the user's most-recently accessed item.

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43. An arrangement according to claim 30, wherein said items are associated with virtual features each of which has an associated location in said space, the or each item associated with a said feature having as its own associated location the location associated with that feature; said indicator of the current user's progress around the space being the sequence of at least the two features associated with items most recently accessed for presentation by the user, and the identifying means being arranged to identify as said relevant visit history data the visit history data of previous users having a same sequence of features with items accessed for presentation as the sequence of such features for items most recently

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accessed for presentation by the user, the prediction means being arranged to determine said probability of usage on the basis of portions of said relevant visit history data concerning item usage onward from the user's most-recently visited feature.

5 **44.** An arrangement according to claim 30, wherein the prediction means is arranged to determine said probability of usage using portions of said visit history data that are relevant to the progression onward of the current user, said visit history data being data about one of:

- the items, or groups of associated items, next visited by said previous users;
- 10 - the items next accessed for presentation, or the groups of items with which those items are associated, by said previous users;
- the items next delivered, or requested for delivery, to the mobile-device caches of said previous users.

15 **45.** An arrangement according to claim 25, wherein the cache manager is arranged to load an item into the cache on the basis of the probability of usage determination carried out by the prediction means, this item being an item in respect of which the prediction means has carried out a probability of usage determination and the determined probability is above a threshold value for loading items in the cache.

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46. An arrangement according to claim 25, wherein the cache manager is arranged to load an item into the cache on the basis of the probability of usage determination carried out by the prediction means, this item being an item not identified in a set of items having probabilities of usage, as determined by the prediction means, below a threshold value for
25 loading items into the cache.

47. An arrangement according to claim 25, wherein the cache manager is arranged to remove an item from the cache on the basis of the probability of usage determination carried out by the prediction means, this item being an item in respect of which the
30 prediction means has carried out a probability of usage determination and the determined probability is below a threshold value for retaining items in the cache.

48. An arrangement according to claim 25, wherein the cache manager is arranged to remove an item from the cache on the basis of the probability of usage determination carried out by the prediction means, this item being an item not identified in a set of items having probabilities of usage, as determined by the prediction means, above a threshold
- 5 value for loading or retaining items in the cache.